



LT0341

MX LOOP TESTER USER MANUAL

Issue 1.21; 31 May 2006

The MX LOOP TESTER is manufactured for:

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AMENDMENT LOG

Date	Manual Issue	Applies to firmware version	Notes
10 March 2004	Issue 1.0	V1.00	Original
18 April 2005	Issue 1.1	V1.10	Updated for software V1.10 operation.
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CHAPTER 1 INTRODUCTION

1.1 ABOUT THIS MANUAL

This is intended to provide all information and procedures required to commission an MX loop using the MX Loop Tester. It predominantly covers the operation of the MX Loop Tester.

1.2 ASSOCIATED DOCUMENTATION

1.2.1 STANDARD RELATED

The following Standards are relevant for Australia and New Zealand.

AS1670.1 Fire Detection, Warning Control and Intercom Systems
System Design, Installation, and Commissioning, Part 1: Fire.

AS1851.8 Maintenance of Fire Protection Equipment
Part 8 - Automatic Fire Detection and Alarm Systems.

NZS4512 Fire Detection and Alarm Systems in Buildings

Reference should be made to the relevant standards associated with the project and / or geographic area.

1.3 TERMINOLOGY

4100MXP	4100 MX Protocol Interface Card
CO	Carbon Monoxide
CV	Current Value (Filtered reading from detector)
ELD	End of Line Device
LED	Light Emitting Diode (Visual Indicator)
Module	Addressable I/O device that interfaces to the 4100MXP via the MX Digital Loop
MX Loop	The wiring that allows a 4100MXP to communicate with and supply power to the addressable devices it is to monitor
Point	Any addressable device (detector or module) with a unique address that is connected to the MX loop
PSU	Power Supply Unit
ROR	Rate of Rise
Sensor	Part of a detector that senses the environment - smoke or temperature or CO
Tracked Value	Long term average of a detector reading, which is assumed to be the reading in clean pure air

1.4 INTRODUCTION TO MX LOOP TESTER

The MX Loop Tester is a unit that is used to test and commission a loop of MX detectors and ancillary devices, without having to connect the loop to a fire panel.

The MX Loop Tester supports up to 250 MX devices on the loop. The supported MX devices are shown below.

HEAT detectors	PHOTO/HEAT detectors	CO/HEAT detectors	ION detectors	CO/PHOTO/HEAT detectors
801H 811H 812H 814H	801PH 811PH 812PH 814PH 813P (PHOTO only) 814P (PHOTO only)	801CH 811CH 812CH 814CH	801I 812I 814I	801PC

VESDA Laser COMPACT	FLAME Detectors	Input Monitor	Manual Call Point	Output Control
VLC800MX	801F 811F	MIM800 MIM801 CIM800 DIM800 DDM800 BDM800 LAV800	CP820 CP830 CP820M CP830M DIN820i DIN830i RMS800 GAR800 GARA800	RIM800 SNM800 LPS800 SAM800 SAB800 SAB801

Input Output Module	MX Ex'n' Devices	MX Intrinsically Safe Ex Detectors / Devices	
SIO800	* 811CHExn	801CHEx	801FEx
DIO800	* 811PHExn	801PHEx	811FEx
MIO800	* 811HExn	801HEx	S271i+
APM800	* CP830Exn	IF800Ex	S271f+
		CP840Ex	

* Note the 811CHExn, 811PHExn, 811HExn and CP830Exn are based upon, and have the same algorithms and device IDs as the Marine variants 811CH, 811PH, 811H and CP830M respectively. There is no way to differentiate between the Exn range and Marine variants in the MX Loop Tester.

The MX Loop Tester is modified from a 4100MXP module. The hardware remains the same, with a change in software only. Therefore, for a hardware description of the MX Loop Tester, refer to the 4100MXP Engineering/Technical Manual (LT0313).

WARNING: The MX Loop Tester is not an intrinsically safe device and must therefore only be used within the safe area and on the safe side (i.e. safe side of the barrier if fitted) when testing Ex / Exn addressable devices, taking all appropriate precautions associated with the environment.

1.5 SPECIFICATION

1.5.1 PHYSICAL

Carry Bag Size	250mm x 250mm x 70mm
Unit size	200mm x 122mm x 46mm
Material	1.0mm zintec
Finish	Pretreat, powdercoat silver
Colour	Pearl 915 56960 (orica)
Shipping Weight	2 kg (without battery)

1.5.2 POWER SUPPLY

Mains input	90 – 264V, 50 – 60Hz AC
Secondary Voltage	24Vdc nominal
Secondary Current	3A
Battery	2 x 12V sealed lead-acid (not included)
Working Supply Range	18V min, 33V max
Maximum Supply Current	2.8A (at full load of 1A, and minimum supply of 18V)
Internal Fusing	Each 24V DC socket is protected by a 3A fuse
Battery Tabs	“Batteries to DC Socket” Lead provided (LM0373)

Note: The AC Adapter provided is not entirely suitable for charging the batteries. An alternative charger may be required.

1.5.3 ENVIRONMENTAL

Operating Temperature	0°C to 45°C
Storage Temperature	-20°C to 70°C (not battery) -15°C to 30°C (battery only)
Humidity	0% to 95% RH, non-condensing\

1.6 ORDERING CODES

1.6.1 MX LOOP TESTER

Description : FP 1953-139 MX LOOP TESTER

The MX Loop Tester can be ordered with an Australian/New Zealand/Fiji mains to IEC connector cord as FP0898, or with an Europe/UK mains to IEC connector cord as 557.203.021.

FP0898	MX Loop Tester with Australian/New Zealand/Fiji mains to IEC connector cord
557.203.021	MX Loop Tester with Europe/UK mains to IEC connector cord

Both units are supplied in a multi-compartment carry bag complete with the following items:

LT0341	Operator Manual
SU0256	90-264V AC to 24V DC mains power supply
LM0373	“Batteries to DC Socket” loom
LM0076	DB9 null modem for connecting to the laptop/computer

and suitable power cord for either Australian/New Zealand/Fiji or Europe/UK.

1.6.2 SPARE PARTS

The following items can be ordered as spare parts:

A/NZ Part No.	UK Part No.	Description
LM0076	557.203.022	LOOM 1922-25 ECM PROG DB6 (FEM) –DB9 (FEM) NULL MODEM Spare DB9 null modem cable for serial connection of MX Loop Tester to laptop/computer.
SU0255	557.203.023	SUNDRY CARRY BAG 2 POCKETS 1 STRAP 250 X 250 X 70MM Spare multi-compartment carry bag for MX Loop Tester.
SU0256	557.203.024	SUNDRY PSU 90-264V AC IN 24V DC 3A OUT IEC Spare MX Loop Tester 90-264V AC to 24V DC mains power supply. Does not include IEC cable to wall outlet.
LM0373	557.203.026	LOOM SET MX LOOP TESTER BATTERY LEAD SET Spare set of MX Loop Tester “Batteries to DC Socket” leads, with DC adaptor plug fitted.

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CHAPTER 2

INSTALLATION & SETUP

2.1 CARRY BAG

A multi-pocket carry bag is used to carry the MX Loop Tester and associated items. It is very convenient for a technician to carry around on the site when performing commissioning. The bag contains:

1. MX Loop Tester
2. LM0076 (to connect the MX Loop Tester to the laptop)
3. 24V, 3A power pack and mains lead – Australia/NZ/Fiji or Europe/UK
4. “Batteries to DC Socket” Lead (LM0373)
5. MX Loop Tester User Manual LT0341

There is enough room in the carry bag for two 12V, 1.5A batteries (not included) to power the MX Loop Tester if there is no mains supply available.

2.2 MX LOOP TESTER WIRING

2.2.1 MX LOOP CONNECTIONS

Connect the MX LOOP LEADS (AL+ / AL- and AR+ / AR-) of the MX Loop Tester to the loop of MX devices. Refer to the installation details of each MX device for its wiring instructions.

When testing a line (spur) or a single ended loop (i.e. a not yet completed loop), there are 2 options of which pair of terminals (AL+/AL- or AR+/AR-) to use to connect to the line.

- Use either AL+ / AL- pair, or AR+ / AR- pair, with the other unused pair left disconnected. There will be a loop open circuit fault generated.
- Connect the 2 positive clips together (AL+ to AR+), then connect them to the positive wire of the line. Connect the 2 negative clips together (AL- to AR-), then connect them to the negative wire of the line. With this option, there will not be any loop open circuit fault.

2.2.2 POWER SUPPLY, BATTERY CONNECTIONS

Attach an appropriate mains lead to the 24V, 3A power pack. Connect the power pack to the 24V DC POWER socket. If battery charging / operation is desired, use the ‘Batteries to DC Socket’ lead (LM0373) to connect 2 x 12V batteries in series to the 24V DC BATTERY socket.

NOTE: The supplied 24V, 3A (70W) power pack is not entirely suitable for charging the batteries as it charges the batteries at only 24.0V. An external charger may be used with an appropriate lead plugged into 24V DC POWER socket.

2.2.3 PC / LAPTOP CONNECTIONS

Connect the SERIAL PORT socket to a computer / laptop serial (COM) port via the null modem cable LM0076 provided. On the pc / laptop run a terminal emulator program (e.g. AccuTerm, HyperTerm) at 19200 baud, 8 data bits, no parity, 1 stop bit, Xon / Xoff.

2.2.4 MX LOOP POWER

If a 24Vdc supply is needed for any MX devices (e.g. DIM800), some extra 24V batteries could be used. Alternatively, if powering the MX Loop Tester from the mains power pack a lead with a suitable connector could be made up and plugged into the 24V DC BATTERY socket on the MX Loop Tester. The 24V DC BATTERY socket is internally protected by a 3A inline fuse.

2.3 DIP SWITCHES AND LINKS

The following are factory set and should need changing only if a replacement board is fitted or programming the Flash memory is required.

2.3.1 DIP SWITCHES

Set all internal DIP switches to ON positions.

2.3.2 LINKS ON MX LOOP TESTER BOARD

LK1 REMOVE TO INHIBIT FLASH WRITE

This link controls whether the Flash memory of the microprocessor can be written, i.e. new firmware programmed. Ensure it is inserted to reprogram the Flash manually, as described in Section 3.5 FLASH PROGRAMMING.

Remove the link to positively inhibit Flash writing. However note that this is not normally necessary, as there are several safeguards to prevent inadvertent writing of the Flash.

LK2 FIT TO BOOT

Insert this link only when reprogramming the onboard Flash as described in Section 3.5 FLASH PROGRAMMING.

LK3 A and LK4 B

These links are not used for anything at present. However for compatibility with future software versions, do not insert them.

LK5 4100 / 4100U

This link will not have any effect on the MX Loop Tester's operation, hence fit the link from pin 2 to pin 3 (4100).

LK6 MX LOOP SHIELD

Fit the link from pin 1 to pin 2 to connect the MX LOOP shield connector to 0VS. Fit the link from pin 2 to pin 3 to connect the MX LOOP shield connector to the chassis. Normally there is no shield fitted or required on the MX LOOP so this setting is irrelevant.

2.4 MX LOOP TESTER LEADS

The MX Loop Tester has 3 internal LEDs that operate as follows. Access to these during normal use is not required as all information they indicate is shown on the laptop / computer.

LD1 Yellow 4100 TROUBLE LED.

LD1 is steady ON at all time.

LD2 Yellow MX LOOP TROUBLE LED.

Single Flash = MX Loop shorted.

Double Flash = MX Loop Open.

Steady = One or more scanned devices are not responding, but the loop is otherwise OK.

Off = normal, all scanned devices are responding.

LD3 Red STATUS LED

Single Flashes when board powered up and software running correctly.

2.5 DEVICE LEADS

1. Device LEDs will blink when polled (normally every 5 seconds). 812 series detectors will blink with a green LED and all other detectors will blink with a red LED. This works irrespective of the device programming of "blink on poll" using the 801AP service tool.
2. Any device in alarm will generally have its red LED turned on.
3. If no device red LEDs are turned on as described in (2) above, then any devices in fault and any unknown (not supported) devices will have their red LED turned on steady. The SS command (refer Section 3.3.4) will display the off-normal devices and their states. Additionally, the device LEDs can be turned on by diagnostic commands from the laptop connected to the MX Loop Tester (see Section 3.3.7 LED OPERATION COMMANDS for details).
4. There is no limitation on the number of LEDs turned on at any one time due to (2) or (3) above, except for the Intrinsically Safe E.X. devices where only 1 device LED is turned on at a time.

2.6 RELAY OUTPUT

The MX Loop Tester relay output (TB2) is currently not used.

2.7 LOOP ELECTRICAL TESTS

If you carry out an earth test of the MX loop with a laptop or charger connected to the MX Loop Tester that is connected to the loop, the test may fail due to the laptop or charger earthing the MX loop. Also a loop continuity test will fail if isolator bases are present.

CHAPTER 3

OPERATION AND DIAGNOSTICS TERMINAL

3.1 INTRODUCTION

On power up the MX Loop Tester automatically enters the One Person Installation Mode. Refer to Section 3.3.9 One Person Installation Mode for details on this mode. While in One Person Installation Mode, you can enable the Auto-Addressing Mode for ease of address programming, as any un-programmed device (with address 255) installed will be set to the next available address automatically. Refer to Section 3.3.10 Auto-Addressing Mode for details on this mode. The One Person Installation Mode (whether Auto-Addressing Mode is enabled or not) continues until the automatic Loop Test is activated.

After a Loop Test is carried out the MX Loop Tester operates as if it is fire panel. Any devices removed or added are annunciated as a fault, and any changes of state are logged.

The MX Loop Tester provides operator and diagnostics functions via its diagnostics serial port (P1) with a terminal or PC connected. Commands may be entered to:

- Perform an automatic Loop Test.
- Perform a Walk Test.
- Perform an Alarm Test.
- Enable Auto-Addressing Mode.
- Display up to 1000 history events.
- Operate device LEDs.
- Operate device outputs (relays and sounders).
- Display Walk Test results.
- Display device status.
- Set and display time & date.
- Identify all the devices and their types, as seen from each end of the loop.
- Change a device's address.

Each command has to be followed by the appropriate parameters (if applicable) and ended with the <ENTER> key.

For most commands this will be followed by an immediate prompt ">>" on the next line. But if the command is to carry out a test that will take quite a long time (e.g. automatic Loop Test and Alarm Test), the prompt ">>" will be displayed at the end of the test.

Note that during a lengthy test (automatic Loop Test / Alarm Test), pressing the ESCAPE key will terminate the test, while pressing the <ENTER> key will result in a prompt being displayed so that a new command can be entered.

The MX Loop Tester's diagnostics serial port operates at 19200 baud, 8 data bits, no parity, 1 stop bit. A LM0076 loom is required between the MX Loop Tester's SERIAL PORT socket and the PC terminal.

The colour logging facility is enabled by default. To utilise the colour logging facility an ANSI terminal emulator mode is required. Hyperterm, AccuTerm and Wincomms (V1.22 onwards) are suitable for Windows, and Procomm is suitable for DOS. For simple applications where logging to disk and scroll-back are not required, mxpprog32 can be used with Windows and mxpprog can be used with DOS – these are available as part of SF0250 (MXP Software). Refer www.tycosafetyproducts-anz.com.

3.2 MENU OF COMMANDS

To see the menu of commands available, type H <Enter>, HE <Enter>, or HELP <Enter>. This menu of commands will also appear on power up of the MX Loop Tester. The menu is shown below.

```

*** MX LOOP TESTER Version 1.21 (c)2006 ***
----- Help Commands -----
HE          : Displays this help menu
----- MX Loop Test Commands -----
LT          : Start the automatic Loop Test (may take 3 minutes)
WN          : Walk Test on
WF          : Walk Test off
SW          : Show Walk Test status
SS x       : Show status of device x. All off-normal devices if no x
SA         : Show all devices' status
AT x       : Start Alarm Test on detector x. All if no x (may take 1 minute)
ESCAPE key : To abort Loop Test / Alarm Test or de-select all points logging
----- Time / Date Entry Commands -----
TI hh mm ss : Set time, hh=hour; mm=minutes; ss=seconds(optional)
DA dd mm yyyy: Set date, dd=day; mm=month; yyyy=year
SD          : Show the current time / date
----- LED Operation Commands -----
LN n m      : Turn LED and remote LED output on for points n to m
LF n m      : Turn LED and remote LED output off for points n to m
----- Output Operation Commands -----
ON n m      : Turn outputs on for points n to m
OF n m      : Turn outputs off for points n to m

Press any key to continue ...

----- History Events Commands -----
CH          : Clear history events
SH          : Show history events
----- General Diagnostic Commands -----
CA x y      : Change address of device old address x to new address y
ST          : Show General Status
----- MX Loop Functions -----
AN x        : Turn on Auto Addressing Mode (optional x: next available address)
AF          : Turn off Auto Addressing Mode
DP          : Diagnostics poll - determines devices on each end of loop

```

3.3 MX LOOP TEST COMMANDS

The following commands are available to perform commissioning tests on the MX devices on the MX Loop.

3.3.1 LT COMMAND

The LT command (stands for Loop Test) is used to initiate an automatic Loop Test. This consists of a series of individual tests.

The maximum allowable address depends on the number entered following the LT command. If no number was entered, it will default at 250. For example, "LT 200" will initiate an automatic Loop Test with a maximum allowable address of 200. Any device that is found at an address higher than the maximum allowable address is then over-addressed. To clear the over-addressed fault, initiate a loop test by entering "LT" command without any parameter, or by entering "LT x" command where x is higher than the address of the over-addressed device. This is provided all addresses have been programmed (i.e. not the factory default of 255). The maximum allowable address will still apply after the automatic loop test is completed.

An "LT 0" command however will not initiate a loop test, but will stop the polling instead.

```
>>LT  
Max allowable address is 250
```

An example of how to start an automatic Loop Test is shown above. The Loop Test clears the history so that any events detected are recorded at the start of the history. There are 6 individual tests that will be carried out during the Loop Test, which are explained in their order of testing, as shown below:

3.3.1.1 Scanning Test

The first test scans through all the addresses on the MX Loop, identifying the address and device type of all connected devices. While scanning, three kinds of faults are looked for: Duplicate Address, Over-addressed and Unknown Device Type.

If two or more devices are programmed at the same address, they are said to have duplicate address faults.

If a device is found at an address higher than the maximum allowable address, it is then over-addressed. The maximum allowable address depends on the number entered following the LT command, as detailed in Section 3.3.1 LT Command.

```
>>LT 200  
Max allowable address is 200
```

Any device found that is not supported will have an unknown device type fault.

During the Scanning Test, a message saying "Scanning Test in Progress (takes 30 s) ..." will be displayed on the computer screen. There will not be any detailed information on what devices are found, because a summarised result of the test will be generated at the end of all tests. When the Scanning Test is complete, a "Passed" or "Failed" will be displayed. A "Failed" means at least one of the devices scanned is in fault. This particular test will take about 30 seconds.

3.3.1.2 Analog Value Test

The next test is to monitor the analog value of each device on the loop to determine the status (normal / short / open / alarm / fault / dirty, etc). The threshold levels used for each device are detailed in Chapter 4 SOFTWARE DESCRIPTION.

When carrying out this test, a message saying "Analog Value Test in Progress (takes 60 s) ..." will be displayed on the computer screen. Again, there will not be any detailed information on which device is normal or not at this stage, as a summarised result of the test will be generated at the end of all tests. When the Analog Value Test is complete, a "Passed" or "Failed" will be displayed. A "Failed" means that at least one of the devices is off-normal. This test will take about 60 seconds.

```
>>LT  
Max allowable address is 250  
Scanning Test in Progress (takes 30 s) ... PASSED  
Analog Value Test in Progress (takes 60 s) ... FAILED
```

The example above shows that one or more devices are off-normal, such as short / open / alarm / fault / dirty, etc, as the Analog Value Test has failed.

3.3.1.3 Alarm Test

During this test, an Alarm Test will be initiated on all supported detectors. A message saying “Alarm Test in Progress (may take 60 s) ...” will be displayed at the beginning. No details on which detector is normal or not will be displayed while the test is in progress. A summarised result of the test will be shown at the end of all tests. When the Alarm Test is complete, a “Passed” or “Failed” will then be displayed. A “Failed” means at least one of the supported detectors has failed the Alarm Test. This test takes about 60 seconds. The operation is shown in the example below.

```
>>LT
Max allowable address is 250
Scanning Test in Progress (takes 30 s) ... PASSED
Analog Value Test in Progress (takes 60 s) ... FAILED
Alarm Test in Progress (may take 60 s) ... PASSED
```

3.3.1.4 Walk Test

At this stage, you will be prompted with a message saying “Do you want to do Walk Test now? (y/n)”. This gives you the option to skip the Walk Test because it may take some time to complete the test.

```
>>LT
Max allowable address is 250
Scanning Test in Progress (takes 30 s) ... PASSED
Analog Value Test in Progress (takes 60 s) ... FAILED
Alarm Test in Progress (may take 60 s) ... PASSED
Do you want to do Walk Test now? (y/n)y

Walk Test in Progress (Enter WF when done) ...

Thu 06 Nov 2003, 11:53:47 : 21 : CP820 : **Input Alarm**
Thu 06 Nov 2003, 11:54:17 : 21 : CP820 : Normal
Thu 06 Nov 2003, 11:55:07 : 22 : MIM800 : **Input Alarm**
Thu 06 Nov 2003, 11:55:37 : 22 : MIM800 : Normal
>>WF
End of Walk Test
Ready to display test result, please wait ...
```

Referring to the example above, as the “y” key is pressed, the Walk Test will be initiated. To perform a Walk Test, you will have to walk around the MX loop and create an alarm on each device on the loop, according to the on-site drawing. This test is carried out by setting each device into alarm by using smoke test gas, a heat gun, or physically operating call points and other input devices. You will need to record the order of testing each device, including the time at which each device was tested. The device LED will turn on steady (red) when the alarm condition is detected by the MX Loop Tester. After going through all the devices, you can go back to the laptop and compare the results shown on the laptop with the record you noted down. For this reason, it is strongly recommended that you enter the correct current time and date upon power up of the MX Loop Tester (detailed in Section 3.3.6 TIME / DATE ENTRY COMMANDS).

During the Walk Test, any change of state on the devices will be displayed, as shown below.

```
Thu 06 Nov 2003, 10:18:15 : 23 : CIM800 : Normal
Thu 06 Nov 2003, 10:30:22 : 23 : CIM800 : **Input1 Alarm***
Thu 06 Nov 2003, 10:30:27 : 23 : CIM800 : Normal
```

The change in device status also includes when an extra device is added to the loop, or when an existing device is removed from the loop. The speed of detection of any extra device (reported as “Extra Device”) depends on the number of devices already on the loop, more time will be needed when there are fewer devices on the loop.

The maximum time needed for detection of any extra device is about 2 minutes. When a device is removed (reported as “No Response”), it will be detected within 15 seconds. An example is shown below, where an 814PH at address 30 is removed, then put back again, and an 801CH at address 32 is added and removed again.

```
Thu 06 Nov 2003, 10:18:15 : 30 : 814PH : **No Response**
Thu 06 Nov 2003, 10:30:15 : 32 : 801CH : **Device Found**Extra Device**
Thu 06 Nov 2003, 10:32:15 : 30 : 814PH : Normal
Thu 06 Nov 2003, 10:34:15 : 32 : 801CH : Extra Device Removed
```

When you have finished testing all devices, you end the Walk Test by entering the “WF” command (stands for Walk Off). Then the automatic Loop Test will continue.

On the other hand, if the “n” key is pressed at the first prompt then the Walk Test will be skipped. Note you can carry out the Walk Test later as a separate test by simply entering the “WN” command (stands for Walk On), as detailed in Section 3.3.2 WALK TEST COMMANDS. After skipping the Walk Test, the automatic Loop Test will also continue with the next test.

3.3.1.5 Loop Current Test

The loop current is monitored throughout the whole test procedure, but it is displayed only at the end of the automatic Loop Test. However, by entering the “ST” command (stands for Status), the present loop current value will be displayed along with other information, as detailed in Section 3.3.12.2 ST (STATUS) COMMAND.

Note that some loop current might be displayed even when the loop is disconnected. This value needs to be subtracted from the readings to give a more accurate value.

The maximum allowable current depends on the fire panel, as shown below:

```
Max allowable current is:
F4000/MX4428 MXP      : 400mA
UK MX                 : 550mA
4100U/4100MXP/MX1    : 1000mA
```

The maximum loop current that was detected during the test will be displayed, together with the present loop current. You will have to decide whether the displayed value shown is acceptable or not, according to the maximum allowable current for each panel as shown above.

3.3.1.6 Loop Relay Test

The MX Loop is monitored throughout the test to check if the loop is normal / short / open ...etc. The examples below show all the possible results of the loop relay test.

```
Loop left s/c flt
Loop right s/c flt
Loop repeating overload
Loop unexpected overload/supply problem
Loop o/c flt
MX loop Normal
```

During normal operation (including while carrying out the automatic Loop Test), any changes in the loop relay will be displayed. An example is shown below.

```
Thu 06 Nov 2003, 10:16:54 : **Loop o/c flt**
```

3.3.1.7 Results Display

At the completion of the automatic Loop Test a summarised test result will be displayed. Any devices that are off-normal during the automatic Loop Test (but not during Walk Test), or at the completion of the test will be displayed.

All devices identified from each end (AL+/AL- and AR+/AR-) of the loop will also be displayed. At the end, a message saying ~ END OF LOOP TEST ~ will be displayed as an indication of completion of all tests. An example report (showing points 22 and 35 failing the Analogue Value Test because they were permanently in the alarm condition) is shown below.

```
##### MX LOOP TEST RESULT #####
```

```
Off-normal devices were found during Automatic Loop Test:
```

```
22 : CP820 : **Input Alarm**  
35 : 801PH : **Alarm**
```

```
Current off-normal devices:
```

```
22 : CP820 : **Input Alarm**  
35 : 801PH : **Alarm**
```

```
Total devices scanned = 10  
Maximum Loop Current = 96mA  
Present Loop Current = 47mA
```

```
Max allowable current is:  
F4000/MX4428 MXP : 400mA  
UK MX : 550mA  
4100U/4100MXP/MX1 : 1000mA
```

```
MX loop Normal
```

```
Devices scanned from Line 1 (AL+/AL-)
```

```
Adr 3 : 801H  
Adr 21 : MIM800  
Adr 22 : CP820  
Adr 23 : CIM800  
Adr 24 : RIM800  
Adr 25 : DIM800  
Adr 26 : SNM800  
Adr 30 : 801PH  
Adr 32 : 801CH  
Adr 35 : 801PH
```

```
Devices scanned from Line 2 (AR+/AR-)
```

```
Adr 3 : 801H  
Adr 21 : MIM800  
Adr 22 : CP820  
Adr 23 : CIM800  
Adr 24 : RIM800  
Adr 25 : DIM800  
Adr 26 : SNM800  
Adr 30 : 801PH  
Adr 32 : 801CH  
Adr 35 : 801PH
```

```
~ END OF LOOP TEST ~
```

```
>>
```

3.3.1.8 After a Loop Test

Once the Loop Test is completed the MX Loop Tester operates as if it is a fire panel. Any device added or removed will be annunciated as a fault. The polling for new devices (including address 255) will be carried at a slower rate compared to One Person Installation Mode. Therefore Auto-Addressing Mode should not be enabled or used once a Loop Test has been conducted. Restart the MX Loop Tester and put it into One Person Installation Mode again if Auto-Addressing of new devices is needed. The maximum allowable address depends on the number entered following the LT command, as detailed in Section 3.3.1 LT Command.

3.3.2 WALK TEST COMMANDS

If you skipped the Walk Test during the automatic Loop Test, you can perform the Walk Test as a separate test by entering the WN command (stands for Walk On). Make sure that no devices on the loop are in alarm before initiating the Walk Test, as they will pass immediately. This can be done by entering the SS command (refer Section 3.3.4 SS (SHOW STATUS) COMMAND) to see what devices are currently off-normal.

During the Walk Test, most filtering algorithms are bypassed so that the time to alarm (and normal) is reduced to a minimum. Also, any changes of state (alarms, normals, faults etc.) will be logged with the time and date of occurrence.

The log generated should be captured and compared to the record of testing carried out to ensure all devices were tested, the point address was correct for each location installed, and no unexpected events occurred. After finishing the Walk Test, enter the WF command (stands for Walk Off) to indicate that testing is complete. An example is shown below.

```
>>WN
Walk Test Enabled
>>
Thu 06 Nov 2003, 11:53:47 : 21 : MIM800 : **Input Alarm**
Thu 06 Nov 2003, 11:54:17 : 21 : MIM800 : Normal
Thu 06 Nov 2003, 11:55:07 : 22 : CP820 : **Input Alarm**
Thu 06 Nov 2003, 11:55:37 : 22 : CP820 : Normal
>>WF
End of Walk Test
>>
```

While performing the Walk Test (including while performing the Walk Test during the automatic Loop Test), the SW command (stands for Show Walk) can be entered to display the list of supported devices that have not been tested yet (i.e. have not gone into alarm). The SW command will function only in Walk Test mode. An example is shown below.

```
>>SW
Walk Test Status
The following devices have not been Walk Tested yet:
Adr 3 : 801H
Adr 20 : 814I
Adr 30 : 801PH
Adr 32 : 801CH
>>
```

3.3.3 SA (SHOW ALL) COMMAND

The SA command (stands for Show All) can be used to display the status of all devices on the loop, at any time except during the automatic Loop Test. The display shows the point address, device type, dirtiness and status (normal / fault / failed alarm test ...etc). Dirtiness is the percentage dirty, which only applies to Photo detectors (801PH, 811PH, 812PH, 813P, 814P, 814PH, 801PHEX, 801PC).

```
>>SA
Displaying device status of all devices on the loop

ADR :   TYPE    :  DIRTINESS  : STATUS
  4 :   814CH   :           : Normal
  3 :    801H   :           : **Alarm**
 20 :   814I   :           : Normal
 21 :  MIM800   :           : Normal
 22 :   CP820   :           : **Input Alarm**
 26 :  SNM800   :           : Normal
 30 :   801PH   :  0 percent : Normal
 32 :   801CH   :           : Normal

>>
```

3.3.4 SS (SHOW STATUS) COMMAND

The SS command (stands for Show Status) is used to display the status of a single device or all the devices that are off-normal, i.e., fault / alarm / failed alarm test ...etc. Similar to the SA command (stands for Show All), this command can be used at any time except during automatic Loop Test. An example follows, where the SS command is entered without any parameters to display the device status of all off-normal devices.

```
>>SS
Displaying device status of off-normal devices

ADR :   TYPE    :  DIRTINESS  : STATUS
  3 :    801H   :           : **Alarm**
 22 :   CP820   :           : **Input Alarm**

>>
```

If a number is entered following the SS command, then the status of just that device will be shown, including the percentage dirty if it is a Photo detector. An example is shown below:

```
>>SS 30
Displaying status of device 30
ADR :   TYPE    :  DIRTINESS  : STATUS
 30 :   801PH   :  3 percent : Normal

>>
```

If the address entered is an APM800 and if the PSU hardware supports battery test, the battery current and voltage will be displayed along with its device status.

3.3.5 AT (ALARM TEST) COMMAND

The AT command (stands for Alarm Test) can be used to initiate an Alarm Test of a single device, or all capable devices. To perform a test on all devices in the MX Loop Tester's database, enter the AT command without any number, as shown below.

```
>>AT
Doing Alarm Test on the following devices at Points (may take 60 s):
  30 (814PH)
  32 (801CH)

  814PH at 30 passed Alarm Test
  801CH at 32 passed Alarm Test
End of Alarm Test
>>
```

To test an individual device, use the command followed by the desired device address.

```
>>AT 20
Doing Alarm Test on device at Point 20 - 814I (may take 60 s)
  814I at 20 passed Alarm Test
End of Alarm Test
>>
```

If the specific device address entered for the AT command is an APM800, a battery test will be carried out if the PSU hardware supports the test. This is the only AT command that will execute a battery test on APM800. When the AT command is entered with no address (all detectors) or carried out as part of the Loop Test, any APM800 devices will be skipped (no battery test).

All capable detectors (8xxPH, 814P, 8xxCH, 8xxI, 801CHEx, 801PHEX, 801F, 801FEx, 811F, 811FEx, VLC800, S271i+ and S271f+) may be Alarm Tested. Any detectors that fail the Alarm Test will be reported as "Failed Alarm Test", and the device LED will be turned on to indicate fault. Note any events (e.g. Failed Alarm Test, Normal) detected during the Alarm Test will be listed after the line "End of Alarm Test".

Carbon Monoxide (CO) and VLC800MX detectors can take up to 60 seconds to stabilise after doing an Alarm Test. Therefore no action will be taken (displayed as "not actioned" against the point number) when trying to initiate another Alarm Test on any of these detectors within 60 seconds of the previous Alarm Test.

3.3.6 TIME / DATE ENTRY COMMANDS

The time and date are useful when carrying out the Walk Test and for accurate logging of events. Hence if the time and date have not been entered when carrying out the Walk Test, you will be prompted to do so, as shown below.

```
Time and date not entered yet
```

The TI command (stands for Time) is used to set the current time. It should be followed by the hours, minutes and seconds values. For example, "TI 17 15 35" will set the time to be 5:15:35 pm. If only 2 numbers are entered following the command, the seconds will be set to zero, as shown in the example below.

```
>>TI 17 15 35

Thu 01 Jan 2004, 17:15:35
>>TI 17 15

Thu 01 Jan 2004, 17:15:00
>>
```

The DA command (stands for Date) is used to set the date, with the day, month and year values following the command. For example, "DA 30 10 2004" will set the date to be 30th Oct 2004. The default date is 1 January 2004. If the number entered for the year is less than 2000, then 2000 will be added to it. For example, "DA 30 10 4" will also set the date to be 30th Oct 2004.

```
>>DA 30 10 4
Sat 30 Oct 2004, 17:15:35
>>
```

The SD command (stands for Show Date) is used to show the current time and date.

```
>>SD
Sat 30 Oct 2004, 17:15:35
>>
```

Note the time and date information is lost when the MX Loop Tester is powered down. Therefore, the time and date should be entered every time the MX Loop Tester is turned on.

3.3.7 LED OPERATION COMMANDS

The LN and LF commands (stand for LED On and LED Off) are useful for turning on/off a device's LED and remote indicator output. Both of the LEDs (if present) are controlled by this command. You can turn on/off the LEDs of an individual device, a range of devices, or all devices.

Commands	Function
LN x y	To turn on the LED of the devices from address x to y
LN x	To turn on the LED of the device at address x
LN	To turn on the LED of all devices on the MX loop
LF x y	To turn off the LED of the devices from address x to y
LF x	To turn off the LED of the device at address x
LF	To turn off the LED of all devices on the MX loop

Note: If an alarm is present then turning on the LED will not work. Clear all alarms to allow the LED on command to work.

3.3.8 OUTPUT OPERATION COMMANDS

The ON and OF commands (stand for Output On and Output Off) are useful for turning on/off a device's output. You can choose to turn on/off the output of an individual device, a range of devices, or all devices.

Commands	Function
ON x y	To turn on the output of the devices from address x to y
ON x	To turn on the output of the device at address x
ON	To turn on the output of all devices on the MX loop
OF x y	To turn off the output of the devices from address x to y
OF x	To turn off the output of the device at address x
OF	To turn off the output of all devices on the MX loop

These commands will control the devices as follows:

Devices	Output control
All detectors (PH, CH, HEAT, ION)	Functional base output
SAM800	Functional base output
SAB800	Beacon and functional base output
SNM800, RIM800, SIO800, DIO800, LAV800	Relay (including HVR output for RIM800)
LPS800	Output
MIO800	All outputs (including HVR outputs)
DIM800, DDM800	Output on command resets the power to the 2 detector circuits (turns it off) while the output off command will restore the power.
APM800	Output on command resets the +24V/40V output (turns it off) while the output off command will restore the output

Note the plug-in flame detectors (801F, 801FEx, 811F and 811FEx) can not operate the functional base outputs.

3.3.9 ONE PERSON INSTALLATION MODE

3.3.9.1 Introduction

The One Person Installation Mode allows the user to fit off the bases, install detectors in the bases one by one, also install any devices one by one, and at the same time check the wiring and test that there are no undesirable addresses used. This is the default mode of operation for the MX Loop Tester as soon as it is powered up. A history events display is available.

The usefulness of this mode is when there is only one person carrying out the installation and testing of a new loop. Another situation that will benefit from this mode is when no laptop is available for testing, as no commands are needed to start the One Person Installation Mode.

3.3.9.2 Operating Instructions

When the MX Loop Tester is powered up, it will automatically start the One Person Installation Mode by default without having to enter any commands from the laptop (although entering the time and date is recommended). Installation and testing can be carried out once the MX Loop Tester is turned on. The laptop will display "Loop Scan Started..." to indicate the scanning process is underway.

Connect the first device onto the loop. The device will be detected within 5 seconds. Once detected, the device LED will turn on for between 20 – 65 seconds. This indicates that the wiring polarity is correct. Some device LEDs will turn on for a long time, for example the analog detectors, as they require more time to download all the necessary parameters and read the EEPROM information. Once the device LED turns off, it will blink every 5 seconds as it's polled, indicating any testing can now start. If the LED does not start blinking (i.e. remains on) the device could be permanently in alarm. It will need to be fixed before proceeding.

At this point, the device can be alarm tested. Cause the device to go into alarm by spraying smoke test gas, applying heat or activating a call point. While in One Person Installation Mode, Walk Test Mode is also enabled by default. Therefore all filtering is removed and the alarm condition will be detected quickly (within roughly 15 seconds). When the device LED turns on steady, this (generally) means alarm is detected. Remove the alarm generating condition (e.g. blow out test gas, allow to cool, or switch off input) and check the device LED starts blinking again.

Now go to the next loop position, connect the device, wait for the device LED to turn on and then blink every 5 seconds. Then alarm test as required. Repeat the steps until all devices are installed.

The SW command can be entered from the laptop (if available) to see which devices have not been Walk-tested yet. If filtering is required, Walk Test Mode can be turned off with the WF command. Refer Section 3.3.2 WALK TEST COMMANDS for details.

Once all devices found on initial power-up have been initialised (their LEDs start blinking) then a message "Loop Scan completed" is displayed, to indicate the scan is complete. New devices added after this will still be detected and initialised, tested etc. A warning message will be displayed if not all devices found have been initialised 3 minutes after the last device is found. This might be because they are not responding due to duplicate address.

When all devices are installed, you can either turn off the MX Loop Tester, or continue with the automatic Loop Test for a series of more detailed tests by entering the LT command from the laptop (if a laptop is available). The history events can be viewed too if required, as detailed in the following section.

3.3.9.3 Displaying Results

If a laptop is available, the user can connect the laptop to the MX Loop Tester at the completion of the installation and testing to view the history of events that happened during the One Person Installation Mode. The SH command (stands for Show History) is used to display all history events (up to 1,000 events), and the CH command (stands for Clear History) is used to clear all history events and start again. The details of these commands are stated in Section 3.3.11 HISTORY COMMANDS.

While in the One Person Installation Mode, there are other useful commands that can be used too. The device LEDs and device outputs that drive a relay or sounder can be turned on or off with the LN / LF / ON / OF commands as detailed in Section 3.3.7 LED OPERATION COMMANDS and Section 3.3.8 OUTPUT OPERATION COMMANDS. An Alarm Test can also be carried out in One Person Installation Mode with the AT command as detailed in Section 3.3.5 AT (ALARM TEST) COMMAND.

3.3.9.4 Troubleshooting

Under normal operation, when a new device is detected in One Person Installation Mode, its device LED will turn on for 20-65 seconds and then blinks every 5 seconds after that. When the device LEDs are not behaving as expected, something might be wrong with the wiring or the address programmed. A few examples are shown below:

- **The device LED does not turn on at all when installed.**

Check the wiring polarity, as it might be incorrect.

- **The device LED is not turned on for 20 to 65 seconds when installed, but immediately blinks every 5 seconds (it might however turn on steady a few polls after being installed).**

The device just installed might have a duplicate address already on the loop. There are several ways to find out which device is the duplicate one. Enter SH command (stands for Show History). The detector with "No Response" fault might be the one with a duplicate address.

Another option is to use the DP command (stands for Diagnostics Poll) to report all the detectors found on the loop. Any address that has more than one detector reported will be the one with a problem. The DP command sometimes cannot find the duplicate devices effectively. In this case the best method will be to start an automatic Loop Test with the LT command.

- **The device LED turns on steady, but does not start blinking (stays on steady instead) after 20 to 65 seconds.**

The device is in alarm or fault, or its LED may have been turned on with an LN command. You will need to fix the problem before proceeding.

Look at the event log, the history or use the SS command to determine the device status. Check the device address, as it might be more than the allowable 250. If the MX Loop Tester is in Auto-Addressing Mode, having an address of 255 (the default address when sent out from the factory) will not be a problem, as the address will be set to the next available address, as detailed in Section 3.3.10 AUTO-ADDRESSING MODE.

3.3.10 AUTO-ADDRESSING MODE

Auto-Addressing Mode is a useful feature to automatically set the address of any un-programmed device (with the default address 255) that is added to the loop during One Person Installation Mode. The address will be the next available address, i.e. generally the next address after the highest used number. Any new device with an address other than 255 will remain as it is. This mode is particularly useful during One Person Installation Mode as it allows device address programming without the service tool. It should not be used after completing a Loop Test as new devices will be indicated as fault. Once a Loop Test is done, restart the Loop Tester and put it into One Person Installation Mode before enabling the Auto-Addressing Mode.

To enable the Auto-Addressing Mode enter the AN command (stands for Auto-Addressing On). This can optionally be followed by a number, which will be interpreted as the first available address if there is no device at that address already. If there is a device already at that address then the next highest unused address will become the first available address.

For example, entering "AN 24" will assign the first available address as 24, but if a device is already at 24 then 25 will be used, unless there is a device there already, in which case 26 will be used, and so on. The Auto-Addressing Mode will skip any address for which a device is already present.

Note the Loop Tester will search from 1 up if it found no free address between the number entered and 250.

The following is an example of an event display when an extra device is found with an address 255 and is set to the next available address.

```
Thu 06 Nov 2003, 10:30:20 : 2 : 814CH : **Device Found**Address Set**
```

To disable the Auto-Addressing Mode, enter the AF command (stands for Auto-Addressing Off). Refer Section 3.3.13.1 AN (Auto-Addressing On) and AF (Auto-Addressing Off) Commands for details on the AN and AF commands.

When adding un-programmed devices only add one at a time, wait for it to be recognised and start polling (LED blinks), then add the next device.

3.3.11 HISTORY COMMANDS

These commands are useful for displaying the history of events.

3.3.11.1 SH Command

The SH command (stands for Show History) is used to display the history of events that occurred. A maximum of 1,000 events can be stored, any events more than that will overwrite at event 1,000. For a useful analysis, it is strongly recommended that the time / date be entered at power up, before the test starts.

While in One Person Installation Mode, any device that is first detected will be reported as "Device Found". If the Auto Addressing Mode is enabled, any new device with address 255 will be programmed to the next available address, and will be reported as "Device Found" and "Address Set". However if there are no more addresses available, the new device at address 255 will have a fault of "Unaddressed Device" and the device LED will be turned on.

On the other hand, a new device will be reported as "Extra Device" instead of "Device Found" if not in One Person Installation Mode.

An example follows.

```
>>SH
```

```
~ History Event Display ~
```

```
DATE      :    TIME    : ADR :    TYPE    : STATUS
01-01-2004 : 00:00:00 :   :           : One Person Installation Mode
01-01-2004 : 00:00:00 :   :           : Loop Scan Started
18-04-2005 : 10:08:00 :   :           : Auto Addressing Mode Enabled
18-04-2005 : 10:08:15 :  3 :    801H    : **Device Found**
18-04-2005 : 10:08:45 : 10 :    801CH   : **Device Found**
18-04-2005 : 10:09:10 : 11 :    814PH   : **Device Found**Address Set**
18-04-2005 : 10:10:15 :   :           : Loop Scan Completed
18-04-2005 : 10:18:00 :   :           : Auto Addressing Mode Disabled
18-04-2005 : 10:40:50 : 43 :    801CH   : **Device Found**
18-04-2005 : 10:40:50 : 98 :   MIM800  : **Device Found**
18-04-2005 : 10:40:50 :133 :    CP820  : **Device Found**
```

```
>>
```

3.3.11.2 CH Command

The CH command (stands for Clear History) is used to clear all history events. When cleared, any new event will be saved from the beginning of the list again. Starting an automatic Loop Test will clear the history events too.

3.3.12 GENERAL COMMANDS

3.3.12.1 CA (Change Address) Command

The change address command may be used to change the address of a single device (the first number) on the MX loop to a new address (the second number). If devices are added one at a time, this command may be used to assign their address instead of using the programming tool. New devices from the factory normally have an address of 255. However Auto Addressing mode may be a more efficient method to change an un-programmed device to a new address, as described in Section 3.3.13.1 AN (Auto-Addressing On) and AF (Auto-Addressing Off) Commands.

Both the new and old addresses may be any number greater than 0 and up to 255. Address 0 may not be used at all.

```
>>CA 20 100
Re-address device 20 to 100?(y/n)y
Verify OK
```

If there is no device with the old address, or if there is already a device with the new address, an error message will be displayed and the change will not be made.

Normal polling resumes when the command is completed.

Note the old address will generate a “No Response” event and remain in the Loop Tester’s database after the address is changed. An LT (Loop Test) command can be done to rescan the devices present on the loop. The new device address will generate a “Device Found” event and if a loop test has been done previously then an “Extra Device” event will also be generated.

3.3.12.2 ST (Status) Command

The ST command gives a self-explanatory synopsis of the status of the MX Loop Tester, including:

- Software version programmed into the Flash IC, and compilation time & date
- Device status (responding or not when being polled)
- Number of polling cycles since power-up
- Loop status
- Maximum loop current
- Present loop current
- Auto Addressing Mode status
- Maximum allowable address

Note the present loop current displayed may be non-zero with the loop disconnected. This needs to be taken into account as an offset to give a more accurate loop current reading. Besides displaying the present loop current, it also displays the maximum loop current that has been detected. Every time the ST command is executed, the value of the maximum loop current is cleared.

If the Auto Addressing Mode is enabled, the next available address will be displayed.

The maximum allowable address depends on the parameter entered after the LT command as detailed in Section 3.3.1.1 Scanning Test. It is otherwise default at 250.

An example of display when the ST command is entered is shown below.

```
>>ST
MX LOOP TESTER Version 1.20 (c)2005, compiled 09:56:27 Mar 24 2005
One or more MX loop devices not responding
64758 polling cycles since power-up / database load
MX loop Normal
Maximum Loop Current = 813mA
Present Loop Current = 109mA
Auto Addressing Mode enabled (Next available address: 235)
Maximum Allowable Address = 250
>>
```

3.3.13 MX LOOP FUNCTIONS

3.3.13.1 AN (Auto-Addressing On) and AF (Auto-Addressing Off) Commands

The AN command (stands for Auto-Addressing On) is used to enable the Auto-Addressing Mode. Auto-Addressing Mode is a useful feature to automatically program an address to any un-programmed device (with the default address 255) that is added to the loop. The address will be the next available address, i.e. generally the next address after the highest used number. Any new device added to the loop with an address other than 255 will remain as it is.

An example is shown below:

```
>>AN
Auto Addressing Mode enabled
Next available address is 47
>>
```

If a number is entered following the AN command, it will be interpreted as the first available address. If there is a device already at that address then the next higher unused address will become the first available address. For example, entering "AN 24" will assign the first available address as 24, but if a device is already at 24 then 25 will be used, unless there is a device there already, in which case 26 will be used, and so on. The Auto-Addressing Mode will skip any address for which a device is already present.

An example is shown below:

```
>>AN 100
Auto Addressing Mode enabled
Next available address is 100
>>
```

To start Auto-Addressing with the lowest unused address, enter AN 1 and the MX Loop Tester will search for the first unused address and use this as the next available address. With Auto-Addressing on, if the CA (Change Address) command is used to change a device address to 255, then Auto-Addressing will automatically re-address this device to the next available address. If this is not desired, then turn Auto-Addressing off beforehand.

The AF command (stands for Auto-Addressing Off) is used to disable the Auto-Addressing Mode, as shown below:

```
>>AF
Auto Addressing Mode disabled
>>
```

While in the One Person Installation Mode (on power up), the search for unused address 255 is done within 10 seconds. After a Loop Test is initiated, the search for the unused addresses is slowed down. If faster operation is needed, restart the Loop Tester.

3.3.13.2 DP Command (Diagnostic Poll)

This command attempts to find all devices on the MX loop by issuing a command to each side of the loop (left and right) that requests all devices to identify themselves. Thus it can be used to find what devices are present on the loop, and which devices are found from each end, if the loop is broken or isolator bases have opened. This can help identify which section of the loop cable is broken or shorted.

Note that after completing the automatic Loop Test, the DP command is capable of finding any "Extra Device" that is added to the loop. It is however not capable of identifying the situation when the "Extra Device" is removed. The speed of detection of "Extra Device Removed" depends on the number of devices already on the loop, more time will be needed when there are fewer devices on the loop. The maximum time needed is about 2 minutes.

The DP command will list devices found with any address including addresses above 250. If two or more devices are present with the same address they will usually be detected, however their replies may collide resulting in neither being detected.

Note the DP command does not change the Loop Tester's database of devices present.

An example is shown below.

```
>>DP  
Diagnostic Pollscan will start in a few seconds
```

```
Devices scanned from Line 1 (AL+/AL-)  
Adr  2 : 814CH  
Adr  3 : 801H  
Adr 20 : 814I  
Adr 21 : MIM800  
Adr 22 : CP820  
Adr 23 : CIM800  
Adr 24 : RIM800  
Adr 25 : DIM800  
Adr 26 : SNM800
```

```
Devices scanned from Line 1 (AL+/AL-)  
Adr  2 : 814CH  
Adr  3 : 801H  
Adr 20 : 814I  
Adr 21 : MIM800  
Adr 22 : CP820  
Adr 23 : CIM800  
Adr 24 : RIM800  
Adr 25 : DIM800  
Adr 26 : SNM800  
>>
```

3.4 EVENT DESCRIPTIONS

The table below shows all possible events for the MX Loop Tester, including the mode(s) in which they can be generated and their meaning for each mode.

Notes:

1. No events will be generated during the Loop Test, only off-normal devices will be displayed at the completion of the Loop Test.
2. No events will be generated during the Alarm Test, any status changes will be displayed at the completion of the Alarm Test.

Event	Mode							Description
	One Person Installation Mode		Loop Test ¹	After Loop Test		Alarm Test ²	Walk Test	
	Auto-Addressing Mode enabled	Auto-Addressing Mode disabled		Auto-Addressing Mode enabled	Auto-Addressing Mode disabled			
No Response	√	√	√		√	√	√	A device being removed from the loop, or not responding to polls due to other reasons e.g. broken loop.
No Response				√				A device being removed from the loop, or not responding to polls due to other reasons e.g. broken loop. Or device at address 255 (if it is not an "Extra Device") has been set to the next available address.
Extra Device			√	√	√	√	√	New device added to the loop that is not in the database built during the Scanning Test of the Loop Test.
Extra Device Removed				√	√	√	√	Extra device removed from the loop.
Extra Device Removed				√				If the extra device removed is address 255, it could have been set to the next available address.
Device Found	√	√		√	√	√	√	New device added to the loop.
Address Set	√			√				New device found as a result of device 255 being set to the next available address.
Unaddressed Device	√			√				Device 255 found but no available address to program it to.
Duplicate Fault			√					2 or more devices sharing the same address.
Over-addressed Fault			√	√	√	√	√	Device with address exceeding the maximum allowable address set by the LT command (default at 250).
Unknown Device Type	√	√	√	√	√	√	√	A device that is not supported by the MX Loop Tester.

Event	Mode							Description
	One Person Installation Mode		Loop Test ¹	After Loop Test		Alarm Test ²	Walk Test	
	Auto-Addressing Mode enabled	Auto-Addressing Mode disabled		Auto-Addressing Mode enabled	Auto-Addressing Mode disabled			
Bad Answer	√	√	√	√	√	√	√	Uncalibrated detector / Invalid analog value.
Alarm	√	√	√	√	√	√	√	Input analog value within alarm band (for analog detectors).
Input Alarm	√	√	√	√	√	√	√	Input analog value within alarm band (for modules).
Input1 Alarm	√	√	√	√	√	√	√	Input1 analog value within alarm band (for modules).
Input2 Alarm	√	√	√	√	√	√	√	Input2 analog value within alarm band (for modules).
Input3 Alarm	√	√	√	√	√	√	√	Input3 analog value within alarm band (for modules).
Input Open	√	√	√	√	√	√	√	Analog value within open circuit band (for modules).
Input1 Open	√	√	√	√	√	√	√	Input1 analog value within open circuit band (for modules).
Input2 Open	√	√	√	√	√	√	√	Input2 analog value within open circuit band (for modules).
Input3 Open	√	√	√	√	√	√	√	Input3 analog value within open circuit band (for modules).
Input Short	√	√	√	√	√	√	√	Input analog value within short circuit band (for modules).
Input1 Short	√	√	√	√	√	√	√	Input1 analog value within short circuit band (for modules).
Input2 Short	√	√	√	√	√	√	√	Input2 analog value within short circuit band (for modules).
Input3 Short	√	√	√	√	√	√	√	Input3 analog value within short circuit band (for modules).
Output Open	√	√	√	√	√	√	√	Output analog value within open circuit band (for modules).
Output Short	√	√	√	√	√	√	√	Output analog value within short circuit band (for modules).
Window Fault	√	√	√	√	√	√	√	Window fault (for flame detectors).
Non-Window Fault	√	√	√	√	√	√	√	Non-Window fault (for flame detectors).
Relay/Supply Fault	√	√	√	√	√	√	√	Input analog value within relay fault / supply fault band (for modules).
Relay Fault	√	√	√	√	√	√	√	Input analog value within relay fault band (for modules).
Supply Fault	√	√	√	√	√	√	√	Input analog value within supply fault band (for modules).
Dirty Fault	√	√	√	√	√	√	√	Detector is dirty.
Failed Alarm Test	√	√	√	√	√	√	√	Detector failed the Alarm Test.
Normal	√	√	√	√	√	√	√	Device is not off-normal.

Event	Mode							Description
	One Person Installation Mode		Loop Test ¹	After Loop Test		Alarm Test ²	Walk Test	
	Auto-Addressing Mode enabled	Auto-Addressing Mode disabled		Auto-Addressing Mode enabled	Auto-Addressing Mode disabled			
Ground Fault	√	√	√	√	√	√	√	Ground fault (APM800)
Battery Fault	√	√	√	√	√	√	√	Battery fault (APM800)
AC Mains Fault	√	√	√	√	√	√	√	AC Mains fault (APM800)
Charger Fault	√	√	√	√	√	√	√	Charger fault (APM800)
External 24V Fault	√	√	√	√	√	√	√	External 24 fault (APM800)
Failed Battery Test	√	√		√	√	√		Devices failed the Battery Test
Supply Open	√	√	√	√	√	√	√	Analogue value within supply open band
Supply Short	√	√	√	√	√	√	√	Analogue value within supply short band
BDM800 Fault	√	√	√	√	√	√	√	Analogue value within BDM800 fault band
Beam Detector Fault	√	√	√	√	√	√	√	Analogue value within Beam Detector fault band
BDM800 Fault (Invalid)	√	√	√	√	√	√	√	Analogue value within BDM800 invalid fault band
BDM800 Fault (Illegal)	√	√	√	√	√	√	√	Analogue value within BDM800 illegal fault band
Low LTA Fault	√	√	√	√	√	√	√	Analogue value within plug-in flame detectors low LTA fault band
Detector Operation Fault	√	√	√	√	√	√	√	Plug-in flame detectors failed Alarm Test and in low LTA fault
VLC800MX Fault	√	√	√	√	√	√	√	There is a fault on the VLC800MX
Watchdog Fault	√	√	√	√	√	√	√	A watchdog fault has occurred.
Isolator Operated	√	√	√	√	√	√	√	DDM800 built-in isolator has operated.
* Receive Noise	√	√	√	√	√	√	√	Noise on the MX loop.
*Receive Noise Clear	√	√	√	√	√	√	√	The noise on the MX loop is removed.

* See Section 4.4 MX LOOP NOISE for details on the MX loop noise.

3.5 FLASH PROGRAMMING

On occasion, Tyco Safety Products may provide a new version of the MX Loop Tester software. Usually it will be made available on the www.tycosafetyproducts-anz.com website, as SF0298. This software is stored in the CPU IC, U1. It can be updated in the field as described below.

The "Flash Simple" software will be provided (from the same website) and must be installed on a PC. A connection from a serial port on the PC to the SERIAL PORT of the MX Loop Tester is required. Use the Tyco Safety Products Christchurch LM0076 cable.

Install "Flash Simple" by running `flashsimple_v1_1_install.exe`. Note that in spite of all the copyright notices the program is free.

After installation, run `FLASHSimple.exe`.

Click on Flash / Settings. Select H8/3067F, Direct Connection, Com Port that is used, 19200, BOOT. OK.

Click Browse. Select the new file you have been supplied with (something.s28 or something .mot).

Remove the 4 screws on the 4 corners of the MX Loop Tester cover. Then, remove the metal cover. You will see the MX Loop Tester board inside the case.

Power up or Reset the MX Loop Tester with the BOOT link (LK2) inserted and the FLASH WRITE link (LK1) inserted. Nothing is shown to indicate the MX Loop Tester is in this state as all LEDs are off. Make sure the Reset switch is definitely pressed.

Click "Flash Program" to start downloading the new software. Note there are pauses (< ~1 minute) at around 24% and 53% as the flash is programmed and verified.

If there is an error, check the PC Com Port and connections to the MX Loop Tester SERIAL PORT. Also check that both LK1 and LK2 links on the MX Loop Tester are inserted and making good contact. Note that even if both LEDs are off it may not be that the links are correct and the processor is in 'boot' mode. Press the Reset button firmly again. Then try FlashSimple again.

When completed remove the BOOT and FLASH WRITE links and press Reset.

The red LED should flash.

Update the label on U2 with the new version number. Make sure the version number matches the version number displayed on power up or via the ST command.

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CHAPTER 4 SOFTWARE DESCRIPTION

4.1 ANALOG VALUES

For most MX devices / detectors, the threshold levels depend on the operating modes they will be programmed to in the fire panel. Thus, the MX Loop Tester is not capable of finding out the intended operating mode of the devices / detectors as programming is done later. Therefore some sensible assumptions have been made regarding the operating modes in order to have reasonable threshold levels that make sense. This section lists all MX devices supported by MX Loop Tester (new devices could be supported by upgrading software), with the details of the threshold levels (for fault, alarm, normal ...etc). For details of the intended thresholds and algorithms later, refer to the programming information of the fire panel to be used.

4.1.1 TRACKED VALUE (AVERAGE) ADJUSTMENTS

The tracked value of a smoke detector is adjusted as follows -

Let

Ta = the time since the last adjustment during which the slope limited value has exceeded the tracked value.

Tb = the time since the last adjustment during which the slope limited value has been less than the tracked value.

If **Ta - Tb** is greater than 1 minute, adjust the tracked value up by 1.

If **Tb - Ta** is greater than 1 minute, adjust the tracked value down by 1.

The net result is that as long as the slope limited value is consistently higher than the tracked value, the tracked value will be increased by 1 every minute. As long as the slope limited value is consistently lower than the tracked value, the tracked value will be decreased by 1 every minute. If the slope limited value is equally above and below the tracked value, the tracked value will not be adjusted at all. The original time to update the tracked value was every 30 minutes, however 1 minute was chosen to speed up the process for the MX Loop Tester.

4.1.2 DIRTY VALUES

The following table shows the values used to determine the dirty state of photo detectors. These are in MX detector units, which are also the units used for return and display of the average values. The detector is in the state shown when its average (tracked) value is greater than or equal to the value given. There is no dirty check for ION, CO detectors and VLC800MX.

Detector Type	100% Dirty
PHOTO	56

Note the percentage dirty value displayed (as detailed in Section 3.3.3 SA (SHOW ALL) COMMAND and Section 3.3.4 SS (SHOW STATUS) COMMAND) is close to that shown by the 801AP service tool, but can be different to that of MX4428. The MX4428 percentage dirty is calculated over a smaller range, therefore the MX4428 value reads low compared to that displayed by the MX Loop Tester and the 810AP. But all products should indicate 100% dirty at about the same point.

4.2 SMARTSENSE FILTERING

The "SmartSense" filter consists of an exponential filter followed by a step limiting filter. This is used for 814 series detectors. For details in its algorithm, refer 4100MXP Engineering/Technical Manual (LT0313).

4.3 COUNT OF 3 FILTER

The 801 series, 811 series, 812 series and 813 series (i.e. non-814 series) detector processing uses a "count of 3" filter to reduce susceptibility to false alarms (Instead of the SmartSense algorithm). For details in its algorithm, refer 4100MXP Engineering/Technical Manual (LT0313).

4.4 MX LOOP NOISE

Before the MX Loop Tester transmits each message to a detector, it checks to see if the loop is clear of device transmissions. If it appears that other detectors are trying to transmit signals (e.g. an interrupt), the MX Loop Tester waits until the loop is clear. Instead of waiting forever, it times out indicating there could be a level of noise on the loop that seems like a signal to the MX Loop Tester. In this situation, the message will still be sent and an event "Receive Noise" will be generated to indicate this. When the MX Loop Tester is able to transmit and receive messages without any problems, an event "Receive Noise Clear" will be generated to indicate that the noise from the MX Loop is removed.

4.5 HEAT PROCESSING

4.5.1 CONVERSION OF DETECTOR READING TO °C

The temperature readings from the detector (8xxH, 801Hex, 811HExn or the temperature element of an 8xxPH, 8xxCH, 801PC, 801PHEX, 801CHEX, 811PHExn, 811CHExn) are returned from input AI1 (AI0 for 801PC) of the MX ASIC. These are converted to °C according to the following table. This gives the closest temperature for each reading.

Rdg	°C	Rdg	°C	Rdg	°C	Rdg	°C	Rdg	°C	Rdg	°C	Rdg	°C
0	Fault	40	7	80	26	120	42	160	59	200	80	240	120
1	Fault	41	7	81	27	121	42	161	59	201	81	241	120
2	Fault	42	8	82	27	122	43	162	60	202	82	242	120
3	Fault	43	8	83	28	123	43	163	60	203	83	243	120
4	Fault	44	9	84	28	124	44	164	60	204	84	244	120
5	0	45	9	85	28	125	44	165	61	205	85	245	120
6	0	46	10	86	29	126	44	166	61	206	85	246	120
7	0	47	10	87	29	127	45	167	62	207	86	247	120
8	0	48	11	88	30	128	45	168	62	208	87	248	120
9	0	49	12	89	30	129	45	169	63	209	88	249	120
10	0	50	12	90	30	130	46	170	63	210	89	250	120
11	0	51	13	91	31	131	46	171	64	211	90	251	Fault
12	0	52	13	92	31	132	47	172	64	212	90	252	Fault
13	0	53	14	93	32	133	47	173	65	213	91	253	Fault
14	0	54	14	94	32	134	48	174	65	214	92	254	Fault
15	0	55	15	95	32	135	48	175	66	215	93	255	Fault

16	0	56	15	96	33	136	48	176	67	216	94		
17	0	57	16	97	33	137	49	177	67	217	95		
18	0	58	16	98	34	138	49	178	68	218	95		
19	0	59	17	99	34	139	50	179	68	219	97		
20	0	60	17	100	34	140	50	180	69	220	98		
21	0	61	18	101	35	141	50	181	69	221	99		
22	0	62	18	102	35	142	51	182	70	222	100		
23	0	63	19	103	35	143	51	183	70	223	102		
24	0	64	19	104	36	144	52	184	71	224	103		
25	0	65	20	105	36	145	52	185	72	225	104		
26	0	66	20	106	37	146	53	186	72	226	105		
27	0	67	20	107	37	147	53	187	73	227	107		
28	0	68	21	108	37	148	53	188	73	228	108		
29	0	69	21	109	38	149	54	189	74	229	109		
30	0	70	22	110	38	150	54	190	74	230	110		
31	0	71	22	111	39	151	55	191	75	231	112		
32	1	72	23	112	39	152	55	192	75	232	114		
33	2	73	23	113	39	153	55	193	76	233	115		
34	3	74	24	114	40	154	56	194	77	234	117		
35	3	75	24	115	40	155	56	195	77	235	119		
36	4	76	25	116	40	156	57	196	78	236	120		
37	5	77	25	117	41	157	57	197	79	237	120		
38	5	78	25	118	41	158	58	198	79	238	120		
39	6	79	26	119	42	159	58	199	80	239	120		

The MX Loop Tester has no mechanism to find out whether the heat detector is programmed to be ROR enabled or disabled. Hence the temperature value is used to determine whether it is in alarm. The fixed temperature alarm for all non-I.S. heat sensors (except for 801PC), 811HEXn, 811PHEXn and 811CHEXn is 63°C, and is 58°C for 801PC, 801HEX, 801PHEX and 801CHEX. The pre-alarm threshold is ignored as it is not that critical. Any reading of 0 – 4 (well below 0°C) or 251 – 255 (well above 120°C) will generate a fault.

There are several filtering mechanisms used for different detector types. 814 series detectors use Smartsense filtering, while other non-814 series including the Intrinsically Safe Heat detectors use the Count of Three algorithm. Recognition of an alarm will take about 1 minute for 814 series detectors, and about 15 seconds for all other non-814 series detectors. During Walk Test, the Smartsense filtering is removed to fasten the test.

4.6 PHOTO PROCESSING

When using the MX Loop Tester, there is no way to find out the desired operating mode for the photo detector. Therefore Fastlogic filtering will not be used, i.e. assume not in fuzzy mode. Enhancement is currently not supported either. 814 series detectors use Smartsense filtering, while other non-814 series detectors including the Intrinsically Safe detector 801PHEX use the Count of Three algorithm. Recognition of an alarm will take about 2 minutes for 814PH, and about 15 seconds for all other photo detectors. During Walk Test, the filtering is removed to fasten the test.

The alarm threshold is 80 for the 814PH and 814P, 190 for 801PH / 811PH / 811PHEXn / 812PH / 813P and 145 for 801PHEX. Pre-alarm threshold is ignored as it is not that critical.

The 813P and 814P are PHOTO only detectors.

In the diagnostic printouts of detector analogue values a “Thr” value is shown. This is a comparison of the analogue value against the following threshold table.

Band for 814PH, 814P	Band for 801PH, 811PH, 811PHExn, 812PH, 813P, 801PHEx	Thr Display
0 – 13	0 – 55	0
14 – 17	56 – 111	1
18 – 22	112 – 127	2
23 – 31	128 – 144	3
32 – 36	145 – 159	4
37 – 58	160 – 174	5
59 – 79	175 – 189	6
80 – 250	190 – 250	7

4.7

CO PROCESSING

For the CO detector, enhancement is not supported in the MX Loop Tester. 814 series detectors use Smartsense filtering, while other non-814 series detectors including the Intrinsically Safe detector 801CHEx use the Count of Three algorithm. During Walk Test, the filtering is removed to fasten the test. Recognition of an alarm will take about 2 minutes for 814CH, and about 15 seconds for the other CO detectors.

The alarm threshold for CO is 93 for 801CH, 811CH, 811CHExn, 812CH, 814CH and 65 for 801CHEx. Pre-alarm threshold is ignored as it is not that critical. There is no dirty check for CO detectors.

In the diagnostic printouts of detector analogue values a “Thr” value is shown. This is a comparison of the analogue value against the following threshold table.

Band for CO	Thr Display
0 – 25	0
26 – 38	1
39 – 51	2
52 – 59	3
60 – 75	4
76 – 92	5
93 – 159	6
160 – 250	7

4.8

IONISATION PROCESSING

The Count of Three algorithm is used for the 801I and 812I, and the Smartsense algorithm is used for the 814I. During Walk Test, the filtering is removed to fasten the test. The alarm threshold is 66 for 814I and 97 for 801I / 812I. Pre-alarm threshold is ignored as it is not that critical. Recognition of an alarm will take about 2 minutes for 814I, and about 15 seconds for 812I and 801I.

In the diagnostic printouts of detector analogue values a “Thr” value is shown. This is a comparison of the analogue value against the following threshold table.

Band for 814I	Band for 812I, 801I	Thr display
0 – 15	0 – 74	0
16 – 22	75 – 85	1
23 – 65	86 – 96	2
66 – 129	97 – 109	3
130 – 250	110 – 250	4

4.9 VLC800MX PROCESSING

The VLC800MX is a derivative of the standard VESDA Laser COMPACT product family, with the primary difference being that it communicates directly on the MX loop. On the MX Loop Tester the alarm threshold is fixed at 100 (corresponding to a raw value of 112). Pre-alarm threshold is ignored as it is not that critical. There is no dirty check for VLC800MX. The VLC800MX does support Alarm Test. An alarm can be recognised in about 15 seconds.

4.10 MIM800 / CIM800 PROCESSING

For MIM800 and CIM800, Normally Closed operation is not very common, hence Normally Open is used as default. With Normally Open condition, there are 2 operating possibilities – with and without 100 ohm alarm resistors. The one without 100 ohm alarm resistor is chosen as default.

The CIM800 has 2 inputs, the state of which are ORed together to generate the point status. If either input is in fault, the point will be in fault; if either input is in alarm, the point will be in alarm. It may therefore be possible to have both fault and alarm at the same time, due to the 2 inputs respectively. Interrupt operation is disabled.

Without 100ohm alarm resistor	With 100ohm alarm resistor	Normally Open	Normally Closed
–	176 – 255	Short Circuit Fault	Short Circuit Fault
122 – 255	122 – 175	Alarm	
50 – 121	50 – 121	Normal	Normal
0 – 49	0 – 49	Open Circuit Fault	Alarm

Recognition of an alarm will take 0-5 seconds and a fault will take about 15 seconds.

4.11 MIM801 PROCESSING

For the MIM801, Normally Closed is a more common operating mode compared to Normally Open, as in contrast with MIM800. Therefore it makes sense to set Normally Closed as the default operating mode. Also, interrupt is disabled.

Without 100ohm alarm resistor	With 100ohm alarm resistor	Normally Open	Normally Closed
170 – 255	170 – 255	Open Circuit Fault	Alarm
110 – 169	110 – 169	Normal	Normal
0 – 109	40 – 109	Alarm	Short circuit Fault
–	0 – 39	Short Circuit Fault	

Recognition of an alarm will take 0-5 seconds and a fault will take about 15 seconds.

4.12 CALL POINT PROCESSING

Interrupt operation is disabled. An alarm can be recognised within 5 seconds. The CP820 is made without an EOL resistor and no wiring fault monitoring is required as all wiring is internal. All other call point types have the same threshold levels, including the CP830, CP820M, CP830M, CP830Exn, DIN820i, DIN830i, RMS800, GAR800 and GARA800.

A10	Condition
0 – 121	Normal
122 – 255	Alarm

4.13 CP840EX / IF800EX PROCESSING

The CP840Ex is an Intrinsically Safe Weatherproof Break Glass Callpoint used for monitoring and signalling the condition of the switch contact associated with the break glass. The IF800Ex is a Contact Input Monitor used for monitoring fire contacts. Both of these devices have the same threshold levels. An alarm can be recognised within 5 seconds.

A10	Condition
0 – 149	Normal
150 – 255	Alarm

4.14 SAM800 / SAB800 / SAB801 PROCESSING

The Sounder Base Address Modules (SAM800 / SAB800 / SAB801) are designed to control a loop powered sounder base for use with the MX system. They may also be used to drive a relay base. The SAM800 (Sounder Addressable Module) is suitable for wall or ceiling mounting as standard, but it has no integral LED or remote LED drive. The SAB800 / SAB801 (Sounder Addressable Beacon) has a flashing beacon incorporated into the front with a red lens arrangement. It is designed for wall mounting either on a sounder base or on a conventional base. Since all electronics are internal, there is no way to monitor if it is faulty or not.

4.15 DIM800 PROCESSING

The DIM800 has 2 inputs, the state of which are ORed together to generate the point status. An alarm can be recognised within 5 seconds. Recognition of a fault condition takes about 15 seconds.

The unverified input condition is evaluated according to the following table. Both inputs AI0 and AI1 are monitored.

Inputs	Condition
51 – 255	Alarm
22 – 50	Normal
0 – 21	Open Circuit Fault

The 24V supply to the DIM800 is also monitored. If the supply voltage is less than 18V, a Supply Fail Fault will be generated. For this purpose, the fault is generated when the monitored input AI2 is less than the threshold 60. If the supply fails completely, the DIM800 will stop responding to polls.

The 2 detector circuits can be reset by entering the ON command. The power to both detector circuits will stay off until the OF command is entered. This is detailed in Section 3.3.8 Output Operation Commands.

4.16 RIM800 PROCESSING

The RIM800 is an unsupervised output device, although the relay status is monitored by supervising an unused set of relay contacts. Therefore the required algorithms are minimal. The control of the relay is via digital output DO3. Output DO3 is set to high in order to activate the relay; Output DO3 is set to low in order to de-energised the relay.

The state of the relay is monitored by digital input DI0. When the relay has been activated, then input DI0 should be a "1" (high voltage). When the relay has been restored to the inactive state, then input DI0 should be "0" (low voltage). If the monitored relay state, DI0, does not agree with the commanded state of the relay, DI1, then an "OUTPUT STUCK" fault condition exists, as shown below. A fault can be recognised in about 15 seconds.

Correct Relay state	DI0	Condition
Not activated	0	OK
	1	Relay Stuck
Activated	0	Relay Stuck
	1	OK

4.17 SNM800 PROCESSING

The SNM800 is a supervised output device used for driving DC (sounder, strobes) and AC (speakers) notification appliances. The MX Loop Tester monitors the supply, by monitoring the input AI1 as shown below. The Supply Fault will be reported regardless of the status of the output supervision faults. A fault can be recognised in about 15 seconds.

Input AI1	Condition
AI1 > 200	Supply Fault
AI1 <= 200	Supply OK

The thresholds for different conditions are shown in the table below, by monitoring AI0.

Relay Position	AI0	Condition
Not Activated	222 – 255	Open Circuit Fault
	20 – 221	Normal
	0 – 19	Short Circuit Fault
Activated	221 – 255	No Relay Stuck Fault
	0 – 220	Relay Stuck Fault

4.18 LPS800 PROCESSING

The LPS800 is a supervised output device capable of powering and driving sounder devices. The LPS800 output circuits (both the drive circuit and the wiring supervision) are monitored with analog inputs AI0 and AI1 according thresholds shown below. The load supervision can detect short / open on the load wiring only when the output is inactive. Recognition of a fault condition takes about 15 seconds.

Relay Position	AI0	AI1	Condition
Not Activated	201 – 255	0 – 49	Open Circuit Fault
	51 – 110	–	Short Circuit Fault
	0 – 50	–	Relay Fault
	111 – 200	–	Normal
Activated	51 – 255	–	Relay Fault
	0 – 50	0 – 50	Short Circuit Fault
	0 – 50	51 – 200	Relay Fault
	–	200 – 255	Normal

4.19 MIO800 PROCESSING

The MIO800 module has 3 Class B (i.e. spur configuration) inputs. The analog inputs AI0, AI1 and AI2 are used to monitor external switch contacts on the 3 Class B circuits, with the thresholds values shown in the table below. Interrupt operation is disabled.

Inputs	Condition
0 – 19	Open Circuit Fault
20 – 173	Normal
174 – 224	Alarm
225 – 255	Short Circuit Fault

The MIO800 has 2 latching relays capable of switching 2A @ 30V AC/DC. Each control line for the relays can also control an HVR800 (High Voltage Relay). Two additional independent output drivers for HVR800s are also available, meaning a total of 4 HVR800s can be controlled.

Recognition of an alarm will take about 5 seconds and a fault will take about 15 seconds.

4.20 S271I+ / S271F+ PROCESSING

The S271i+ is an intrinsically safe flame detector whereas the S271f+ is the flameproof version. They have the same algorithm but different type ID. The flame detection circuit is based on monitoring for modulated infra-red radiation in the 4.3um waveband corresponding to CO2 emission. Different to the others in the range, the flame detector has its own supervisory microprocessor to control the detection circuit and the way in which it is calibrated. Therefore processing of the analog value by the MX Loop Tester is not required. The thresholds for the different conditions are shown below. The LED is turned on steady while in alarm. Recognition of an alarm will take about 5 seconds and a fault will take about 15 seconds.

Input	Status
190 – 255	Alarm
153 – 189	Pre-alarm
52 – 152	Normal
11 – 51	Window Fault
1 – 10	Non-window Fault

Pre-alarm is not critical. It is therefore ignored in the MX Loop Tester.

There are switch selections on the S271i+ / S271f+ which sets the “Time to Alarm” delay setting and the “Sensitivity (Range)” setting. These are not critical and hence will not be supported either.

The S271i+ / S271f+ does support Alarm Test.

4.21**SIO800**

The SIO800 is a single input/output module that contains a monitored input and an unmonitored output (change-over relay contact). The input is capable of monitoring a normally open or a normally closed contact. An EOL of 3k3 is required. No resistor is required on the output, as it is monitored only for relay stuck. Interrupt operation is disabled.

AI0 is used for supervision of the monitored input. AI1 is the internal relay contact supervision and AI2 is the internal relay feedback. The MX Loop Tester monitors the SIO800 by monitoring the AI0, AI1 and AI2 analog inputs as shown below (with Style B, normally open mode chosen as the default).

Input AI0	Condition
206 – 255	Open circuit
101 – 205	Normal
0 – 100	Alarm

Input AI1	Input AI2	Condition
0 – 150	0 – 150	Normal
	151 – 255	Output stuck
151 – 255	0 – 150	Output stuck
	151 – 255	Normal

Recognition of an alarm will take 0-5 seconds and a fault will take about 15 seconds.

4.22**DIO800**

The DIO800 is a dual input/output module that provides two addressable circuits, each containing an input circuit (for monitoring conventional detectors) and an unmonitored output circuit.

Inputs 1 and 2 are supervised through analog inputs AI0 of the 2 addresses respectively. The MX Loop Tester monitors the DIO800 by monitoring the AI0 analog input as shown below (with Style C, Class B chosen as the default). If only one input is used, the unused input must be terminated with the proper EOL to prevent unwanted fault indications. Interrupt operation is disabled.

Input AI0	Condition
184 – 255	Short circuit
140 – 183	Alarm
16 – 139	Normal
0 – 15	Open circuit

The MX Loop Tester uses a Retard-Reset Period of 5 seconds, a Detector Power Up Period of 30 seconds and a Confirmation Period of 60 seconds. Therefore an alarm condition is detectable within 35 – 95 seconds. During Walk Test, the filtering is removed to fasten the test. Recognition of a fault will take about 15 seconds.

4.23

LAV800

The LAV800 VdS extinguishing interface module provides a control and monitoring interface for a fire extinguishing system according to VdS specification. It consists of an input for monitoring the status of the extinguishing system and a normally open relay contact output for extinguisher release. Interrupt operation is not available.

AI0 is used for supervision of the remote extinguisher. AI1 is the internal relay contact supervision, whereas AI2 is the relay feedback. The MX Loop Tester monitors the LAV800 by monitoring the AI0, AI1 and AI2 analog inputs as shown below.

Input AI0	Condition
206 – 255	Open circuit
101 – 205	Normal
26 – 100	Alarm
0 – 25	Short circuit

Input AI1	Input AI2	Condition
0 – 150	0 – 150	Normal
	151 – 255	Output stuck
151 – 255	0 – 150	Output stuck
	151 – 255	Normal

Recognition of an alarm will take 0-5 seconds and a fault will take about 15 seconds.

4.24

APM800

The APM800 provides an addressable interface to a PSM800 or PSB800 Power Supply Module. The PSM800/PSB800 monitors itself and provides outputs to the APM800 for fault monitoring purposes. The APM800 can control the PSU for battery tests (if the PSU hardware supports the battery test) and disabling the 24/40 VDC output.

The digital inputs are used for fault monitoring as detailed below.

Digital Input	Condition
DI0 = 0	Ground fault
DI1 = 0	Battery fault
DI2 = 0	AC/Mains fault
DI3 = 0	Charger fault
DI4 = 0 and DO3 = 0	External 24V fault
DI4 = 1 and DO3 = 1	

AI0 and AI1 provide analog information on the battery charging current and battery voltage respectively, as detailed below.

AI0	Equation
85 – 255	$I_{batt} = (A/D \text{ reading} - 84) * 0.075 \text{ A battery charge current}$
0 – 84	$I_{batt} = (84 - A/D \text{ reading}) * 0.111 \text{ A battery discharge current}$

AI1	Equation
0 – 255	$V_{batt} = \text{A/D reading} * 0.16953 \text{ V}$

For Issue 5 and later APM800 assemblies, analog input AI2 is used to monitor the 40V/24V output from the power supply. This input is at 40V when the APM800 is monitoring a PSB800 and 24V when the APM800 is monitoring a PSM800, as detailed below.

AI2		Condition
PSB800	PSM800	
252 – 255	162 – 255	40V too high fault
196 – 251	113 – 161	Normal
0 – 195	0 – 112	24V too low fault

AI0, AI1 and AI2 are displayed when logged, but these values are not evaluated for fault monitoring by the MX Loop Tester. The Show Status command (SS x where x = address of APM800) will also display the battery current and voltage along with its device status, according to the AI0 and AI1 shown in the table above.

The APM800 also has the capability of controlling the operation of the power supply in two ways, which are supported by the MX Loop Tester:

- (i) To reset the 24/40 V output (i.e. turn it off), use the Output On (ON) command. The Output Off (OF) command will restore the output. This is detailed in Section 3.3.8 Output Operation Commands.
- (ii) To carry out a battery test on the PSU hardware that supports it, the Alarm Test command (AT x where x = address of APM800) is entered, as detailed in Section 3.3.5 AT (Alarm Test) Command. The command must be for a single address (that of the APM800), as an Alarm Test command on all supporting devices (AT with no address) and the alarm test built into the Loop Test will not test the APM800. When this test is performed, the battery voltage analog input, AI1, is evaluated according to the following:

AI1	Condition
128 – 255	Normal
0 – 127	Battery low fault

4.25 BDM800

The BDM800 is an MX Ancillary interface module that powers and monitors a Beam Detector. The BDM800 supply is commanded to ON (using DO1) at loop power-up. Digital output DO1 is monitored by Analogue input AI2, for correct status. This is detailed below.

AI2	DO1	Comments
0 – 49	0 (supply off)	BDM Fault (Invalid)
50 – 200	Not determined	BDM Fault (Illegal)
201 – 255	1 (supply on)	Beam Detector, Supply and Wiring Status Valid

The detector and supply status are monitored only if the supply is turned on (as monitored by AI2). When the supply is turned on, AI0 and AI1 are used for supervision of the detector status and supply status respectively, as detailed below.

AI0	Detector Status
231 – 255	Wiring Open Circuit
168 – 230	Normal (Beam Detector)
123 – 167	Fault (Beam Detector)
111 – 122	BDM800 Fault
66 – 110	Alarm (Beam Detector)
38 – 65	BDM800 Fault
0 – 37	Wiring Short Circuit

AI1	Supply Status
210 – 255	Normal (Supply)
191 – 209	BDM800 Fault
140 – 190	Supply Open Circuit
84 – 139	BDM800 Fault
61 – 83	Supply Short Circuit
0 – 60	BDM800 Fault

If a supply short circuit is detected then the BDM800 supply will be turned off and a short circuit fault reported. Subsequent to this a status of BDM Fault (Invalid) will be shown until the supply is turned on again. The supply will be turned on every 5 minutes to test if the short circuit condition has been removed or not. If not, supply is turned off again. Otherwise if the short condition has been removed, the supply will stay on.

4.26 801F / 801FEX / 811F / 811FEX

The 801F is a solar blind point type flame detector intended for indoor use, with a Marine version available as 811F. Two intrinsically safe versions are available as 801FEx and 811FEx. Operation is the same for all 4 detectors.

There are 2 operating modes – instant response and verified response. The verified response is used in MX Loop Tester, with interrupt operation being disabled. The following tables show how the MX Loop Tester monitors the detector according to the analog values AI0 and AI1, and the contents of its EEPROM located at &0E and &24. Any other conditions not mentioned here are therefore not supported.

AI0	Condition
0 – (value at &0E minus 1)	Normal
(value at &0E) – 255	Alarm

AI1	Condition
(value at &24) – 255	Normal
0 – (value at &24 minus 1)	Low Long Term Average (LTA) fault

AI0 is monitored for the alarm condition. When AI0 is equal to or higher than the value stored in location &0E, another reading is confirmed 5 seconds later before an alarm condition is raised.

AI1 is monitored for the Long Term Average condition. If AI1 is lower than the value stored in location &24, an alarm test is carried out. If the test passes, an LTA fault is raised if AI1 is lower than the value at &24 minus 2. If the test fails, both an LTA fault and a detector operation fault will be raised.

Recognition of an alarm will take about 5 seconds. Pre-alarm threshold is ignored. There is no dirty check for the flame detectors.

Note these flame detectors can not operate functional base outputs (sounder, relay).

4.27

801PC

The 801PC is a Triple Technology sensor that includes an optical scatter sensor, a temperature sensor and a carbon monoxide sensor.

The heat sensing circuit interfaces to AI0, optical sensing circuit to AI1 and carbon monoxide sensing circuit to AI2. All three AI0, AI1 and AI2 analog inputs are monitored in Mode 1 (Universal multi-criteria sensor) operation. Alarm is reported when any of the three monitored inputs (with Mode 1 algorithm) reaches the alarm threshold as detailed below.

Sensing element	Alarm Threshold
Optical	145 minus (3 x CO Rate of Rise)
CO	93
Heat	157

The optical sensing circuit of the 801PC is monitored to see if it is “dirty” or not as detailed in Section 4.1.2 DIRTY VALUES.

4.28

DDM800 PROCESSING

The DDM800 (Detector Driver Module) is an ancillary device for interfacing conventional detectors to MX panels, similar to the DIM800 but with more functionality and support for different detector families and configurations. The new functionality includes mixed detector and MCP circuits, support for 4-20mA devices, interrupt on short circuit or open circuit, optional loop power, 2 independent circuits, and integrated MX loop isolation.

The DDM800 has 2 inputs, the state of which are ORed together to generate the point status. An alarm can be recognised within 5 seconds. Recognition of a fault condition takes about 15 seconds. AVF and Interrupt operation are not supported.

The digital inputs are used for fault monitoring as detailed below.

Digital Input	Condition
D11 = 1	Watchdog Fault
D14 = 1	Isolator Operated

Digital Inputs DI0, DI2, DI3, DI5, DI6 and DI7 are not monitored.

The input condition is evaluated according to the following table (assuming the default Mode 4 Operation – Style C, mixed detector/MCP circuits). Both inputs AI0 and AI1, corresponding to circuits A and B respectively are monitored.

Inputs AI0, AI1	Condition
238 – 255	Short Circuit Fault
203 – 237	MCP Alarm
58 – 202	Alarm
23 – 57	Normal
0 – 22	Open Circuit Fault

The 24V supply to the DDM800 is also monitored. If the supply voltage is less than 17V, a Supply Fail Fault will be generated. For this purpose, the fault is generated when the monitored input AI2 is less than the threshold 192. The evaluation of AI0 and AI1 will be suspended until the Supply Fail Fault is cleared.

The 2 detector circuits can be reset by entering the ON command. The power to both detector circuits will stay off until the OF command is entered. This is detailed in Section 3.3.8 Output Operation Commands.